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Perception of Word-Initial and Word-Final Phonemic Contrasts Using an Online Simulation Computer Program by Yemeni Learners of English as a Foreign Language in Malaysia

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Abstract. This study aimed to examine the influence of different contexts (word-initial and word-final phonemic contrasts) on the perception of the phonemic contrasts among Yemeni learners of English-as-a-Foreign Language (EFL). The study also sought to ascertain the effect of Length of Residence (LOR) in Malaysia on the perception of selected phonemic contrasts in English by Yemeni EFL learners, as these contracts are presented in different contexts (word-initial and word-final positions). A total of forty-two Yemeni speakers living in Malaysia, 22 men and 20 women participated in this study; they were divided into two groups according to their LORs in Malaysia: group A (four months, short length of residence) and group B (three years, long length of residence). The results revealed a significant effect ($P < 0.05$) for different contexts (word-initial and word-final) on the perception of all participants and between both groups; In the word-initial position, all participants performed much better than in the word-final position.

Keywords: Phonemic contrast; Length of residence; EFL learners; Contrastive analysis; Flege's Speech learning model; Minimal pairs.

1. Introduction

English-as-a-Foreign-Language (EFL) poses both speaking and writing problems to Arabic learners, as reported by numerous studies [1-9]. Arabic learners of English are mostly taught by native speakers of Arabic who mostly use the Arabic language, rather than English, in the classroom and focus on sentence structure rather than correct pronunciation and articulation gestures for English sounds. This creates challenges for Yemeni learners of EFL when they are communicating in English, the lack of opportunity to practice English pronunciation and the prior English pronunciation learning experience are prominent problems in the improvement of English pronunciation and perception. Other factors that challenge the pronunciation and the perception of the English language are the English language instruction, the living in a native speaking country, and the length of practicing the English language [10]. These factors and many others, according to the authors' opinion, increase the possibility for

L1 to influence L2 in all fields, especially in phonology where there is a lack of practice in the pronunciation of English sounds and words.

The Contrastive Analysis Theory (CAT) Stockwell et al. [11] focuses on the differences and similarities between the intended aspects of the study of two different languages (L1 and L2). It hypothesizes that the similarities in any two languages will bring about the positive transfer (no errors), whereas the differences will cause negative transfer or interlanguage [12]. In other words, L2 learners will encounter difficulties in discriminating speech sounds that are nonexistent in their L1. Similarly, models such as Flege's Speech Learning Model (SLM) explained the relationship between L1 and L2 phonology and proposed that ability to process non-native speech can be influenced by the native phonetic gap [13]. For instance, adult Japanese listeners find it difficult to discriminate American English [l] from[ɹ] [14]. According to SLM, /r/ is the only liquid phoneme present in Japanese, and Japanese listeners assimilate both the English [l] and [ɹ].

However, for L2 learners, forming phonological categories in their L2 phonology depends on their ability to successfully perceive and produce L2 sound contrasts that do not occur in their L1 phonology. The L1 phonological system constrains the improvement of perceptual ability since it works as a filter, filtering out L2 sounds that are absent in the L1 phonology. In this way, Flege's speech learning model suggests that improving the perception of phonemic differences between L1 and L2 sounds is the best way for learning a phonemic category of L2 sounds [15].

This study aims to examine the perceptual ability of selected English phonemic contrasts by the Yemen learners of EFL in relation to different contexts (word-initial and word-final position). Therefore, the current study seeks to address the following research questions in relation to the Yemeni EFL learners:

1. *What are the effects of context (e.g., word-initial and word-final position) on the perceptual ability of phonemic contrasts in English?*
2. *What is the effect of length of residence in Malaysia on the perception of the selected phonemic contrasts in English by Yemenis learners of English as they are presented in different contexts (e.g., word-initial and word-final position?*

2. Literature Review

Research in speech perception in second language learning has posited that the perception of the new L2 sounds that have no counterpart in L1 will be easier learned and discriminated than L2 sounds that are close to L1 sounds [16, 17]. Moreover, cross-language research supports the effects of L1 phonological knowledge on L2

phonological perception and production in relation to different factors such as length of residence (LOR) [16-19].

2.1 The Consonant Inventory of Arabic Language and English Language:

Many researchers classify Arabic into three different varieties [20-23]: a) Classical Arabic, also known as Standard Arabic—the language of the Qur'an, Islam's Holy Book; b) Modern Standard Arabic (MSA), which is the standard formal language among Arabs and is mostly written than spoken; and c) Colloquial Arabic, which includes the informally spoken dialects used as a medium of daily contact and are mostly employed in oral communication. Diab, Habash [20] mentioned the existence of numerous dialectal Arabic groups, which can differ within the same country and among countries. This study is restricted to the phonology of Yemeni EFL learners, especially those who speak the Adeni and Ta'aizzi dialects of southern Yemen due to their similarities. The phonemic inventory of MSA includes 28 consonants: eight stops in which the voiced velar stop [g] is not listed, possibly one affricate (in case Arabic has only voiced palatal affricate [ʤ], twelve or thirteen fricatives, two nasals, one trill, one liquid, and two glides. In contrast, English has 24 consonants; six stops, two affricates, nine fricatives, three nasals, two approximants, and two liquids.

The existence of the voiced palatal affricate [ʤ] and voiced alveolar fricative [ʒ] in MSA is somewhat controversial. For example, Amayreh Mousa [24] opined that MSA contains the voiced palatal affricate [ʤ] but not the voiceless palatal affricate [ʧ], the voiced palatal fricative [ʒ], and the voiced velar stop [g]. On the other hand, Huthaily (2003) explains that MSA contains the voiced palatal fricative [ʒ] but not the voiced palatal affricate [ʤ], the voiceless palatal affricate [ʧ], or the voiced velar stop [g]. The dialects of interest in this study (Adeni and Ta'aizzi) use the voiced velar stop consonant [g] always, instead of the palatal affricate [ʤ] or the palatal fricative [ʒ]. In other words, the phonemic inventory of Yemeni dialects in this study includes the voiced velar stop [g] but not the voiced palatal affricate [ʤ], the voiceless palatal affricate [ʧ], or the voiced palatal fricative [ʒ]. Table 1 and Table 2 show the consonant inventories of both the English Language and the Arabic dialect of southern Yemen. The English phonemic inventory presented in Table (2) was derived from [22].

Table 1: The consonant inventory of Arabic dialects of south Yemen

	Labial	Labio-dental	Inter-dental	Denti-alveolar	Palatal	Velar	Uvular	Pharyngeal	Glottal
Stops	b			d t d̲ t̲		g k	q		ʔ
Fricatives		f	ð θ ð̲	z s s̲	ʃ		ʁ χ	ʕ ħ	h
Nasals	m			N					
Lateral				L					
Trill				R					
Glides	w				j				

Table 2: The consonant inventory of the English language

	Labial	Labio-dental	Inter-dental	Alveolar	Alveolar	Palatal	Velar	Glottal
Stops	b p			d t			g k	
Fricatives		v f	ð θ	z s	ʒ ʃ			h
Affricates					ʤ tʃ			
Nasals	m			n			ŋ	
Lateral liquid				l				
Retroflex liquid				ɹ				
Glide						j	w	

A contrastive analysis for the phonemic inventory of MSA and English language was analyzed and studied by Mohammed and Yap (2009). They examined the perception of the phonemic contrasts between /p/ and /b/, /f/ and /v/, and /ʧ/ and /ʤ/. The researchers observed that Yemeni EFL learners found it difficult to perceive the absent phonemic contrasts in their L1. The scores of the discrimination tasks ranged from 44 to 81 out of 96, with percentages of 45.83% to 84.38%. The mean percentage of the discrimination task was62.94% and the standard deviation was 9.63[25]. In addition, the researchers found that the perception of these sounds could be improved as the length of residence is increased in the native L2-speaking country. To the author's knowledge, no previous study has attempted into the perceptual abilities of Arab English learners (speakers of Yemeni dialects in particular) in relation to their context, and therefore this study was conducted.

2.2 The Role of Technology in Pronunciation:

In the study conducted byBusa [26] it was found that Practicing pronunciation with the visualization and comparing it with the native speakers was proven favorable. This method was considered to be significant and powerful for working on their pronunciation in English and asserted that after a few reiterations their inflection patterns would in general look like those of the native speakers [26]. According to the

study conducted on Iranian EFL instructors ‘Pronunciation Power programming’ put a greater obligation on students rather than educators. Further teachers developed their pronunciation job into a student-centered instructional method. Thereby, switching their roles as EFL teachers from being an allocator of knowledge to facilitators and guides making students active learners [27]. Furthermore, based on the study conducted in Taiwan regarding computer-assisted pronunciation learning, it was found that the educators could see the growing experience of their graduates based on their learning reflections'. Thus, instructors can additionally customize the course to address the issues of the learners. In doing so the instructors can acquaint different intervening devices to work with their learning at various learning stages, thereby actually helping them to move to the further advanced stage of learning [28].

3. Research Methodology

3.1 Research Design

A Static Group Comparison design was used for the current studyIt's associated with pre-experimental design because it doesn't allow for much control over uncontrollable variables (such as L1, age, place and years of studying English, and the education level of the learner’s parents) [29]. It requires two or more pre-existing groups, only one of which is exposed to the experimental treatment. No pre-treatment measures are employed. The researcher assumes that the groups are equal in all relevant aspects prior to the beginning of the study, except in their exposure to the independent variable. Then, the dependent variables for the groups are compared to assess the effect of the X-treatment.

In this study, two groups (group A and group B) of native Yemeni learners of English with different lengths of residence in Malaysia (the independent variable) were exposed to the experimental treatment (discrimination task). The scores of the discrimination task (the dependent variable) for the participants in each group were measured and compared to determine the relationship between them (the scores) and the LOR by investigating the effects of treatment in a discrimination experiment.

3.2 Sample

Forty-two Yemeni living in Malaysia, 22 men and 20 women, participated in this study. All had begun studying the English language from the age of 13 in Yemen. Their social interactions in English, both at school and home, were extremely limited, and none had studied the English language at any private institute prior to their arrival in Malaysia. All were monolinguals, and none had had any chance to practice English with native speakers. a convenient sampling was selected, generally all of the sample are from two governorates in the south of Yemen (Aden and Ta'aiz) according to their dialectal similarities.

According on their LORs in Malaysia, the participants were separated into two groups, i.e., Long Length of Residence (LLOR) and Short Length of Residence (SLOR). The samples in both groups were convenience samples.

- **Group A (SLOR)**: consisted of participants ranging between18–35 years (11 men and 10 women). They had been in Malaysia for less than one year to learn the English language or to study for a degree in various fields.
- **Group B (LLOR):** consisted of participants ranging between18–35 years (11 men and 10 women). They had been in Malaysia for at least two years prior to this study, meaning they had received more exposure and underwent more practice of the English language than group A. All were students of various institutions in Malaysian universities.

3.3 Data Collection

The participants were tested on the perception of three phonemic contrasts in English (/f/, /v/), (/p/, /b/), and (/ʧ/, /ʤ/), which are absent in Arabic, using a discrimination task. A questionnaire survey of the subject's background and a discrimination task from previous L2 research was used to obtain the data [16, 30].

4. The Stimuli

Twenty-four items were used as stimuli in the discrimination task. These items included six minimal pairs comprising three each in word-initial and word-final position (pan–ban / lap–lab), (fan–van / leaf–leave), (choke–joke / rich–ridge). They examined the perception of voiceless/voiced phonemic contrasts for the following phonemes in English (/f/ vs. /v/), (/p/ vs. /b/), and (/ʧ/ vs. /ʤ/) by native Yemeni learners. An online computer program AT&T text-to-speech was used to generate the stimuli (L2 words) using two UK models of speech, one male and one female, available from the program. Twenty-four tokens were produced: 12 words with a male voice and 12 words with a female voice. These words, which constituted the aural stimuli for the discrimination task, were chosen according to the voiceless/voiced phonemic contrasts (/p/, /b/), (/f/, /v/), and (/ʧ/, /ʤ/). The voiceless bilabial stop /p/ and voiced labiodental fricative /v/ are both absent in Arabic. As mentioned in section 2.4 (pages 27–28), although the occurrence of (/ʧ/, /ʤ/) in Arabic is still being debated, both sounds are undoubtedly absent in the Yemeni dialects of interest in this study. For each contrast, two minimal pairs were chosen: one in the word-initial position and the other in the word-final position.

After generating the aural stimuli, the word order of the experiment was generated manually by considering the four outcomes of the signal detection task, which was achieved by allowing four expected responses for each item: two different (D) and two same (S). Forty-eight stimuli pairs were thus created out of six items. Table 3shows the word order that was created for the discrimination task. Once the word order was

created, the PRAAT software was used to create the perceptual discrimination experiment. The forty-eight different stimuli were presented twice, resulting in 96 trials: 48 test trials (different) and 48 control trials (same). The stimulus items were presented with a silence duration of 0.8 seconds used as an inter-stimulus interval during the experiment. A laptop computer and headset were used to conduct the experiment.

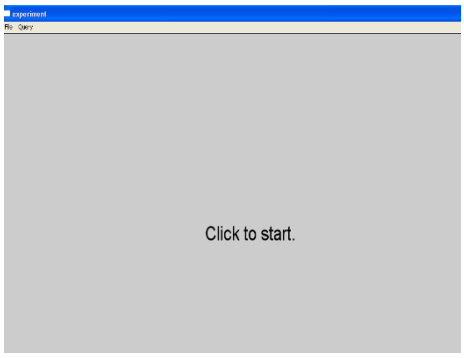
Table 3: The Word Order of the Discrimination Experiment

Items		**Discrimination Task**	**Expected Results**
panM1 panF1	banM1 banF1	panM1,banM1 / panF1,banF1	D/ D
		panM1,panF1 / panF1,panM1	S/S
		banM1,panM1 / banF1,panF1	D/D
		banF1,banM1 / banM1,banF1	S/S
labM1 labF1	lapM1 lapF1	labM1,lapM1 / labF1,lapF1	D/ D
		labM1,labF1 / labF1,labM1	S/S
		lapM1labM1 / lapF1, labF1	D/D
		lapF1, lapM1 / lapM1, lapF1	S/S
fanM1 fanF1	vanM1 vanF1	fanM1,vanM1 / fanF1,vanF1	D/ D
		fanM1,fanF1 / fanF1,fanM1	S/S
		vanM1fanM1 / vanF1,fanF1	D/D
		vanF1,vanM1 / vanM1,vanF1	S/S
leafM1 leafF1	leaveM1 leaveF1	leafM1, leaveM1 / leafF1, leaveF1	D/ D
		leafM1, leafF1 / leafF1, leafM1	S/S
		leaveM1, leafM1 / leaveF1, leafF1	D/D
		leaveF1, leaveM1 / leaveM1, leaveF1	S/S
chokeM1 chokeF1	jokeM1 jokeF1	chokeM1, jokeM1 / chokeF1, jokeF1	D/ D
		chokeM1, chokeF1 / chokeF1, chokeM1	S/S
		jokeM1, chokeM1 / jokeF1, chokeF1	D/D
		jokeF1, jokeM1 / jokeM1, jokeF1	S/S
richM1 richF1	ridgeM1 ridgeF1	richM1,ridgeM1 / richF1,ridgeF1	D/ D
		richM1,richF1 / richF1,richM1	S/S
		ridgeM1, richM1 / ridgeF1, richF1	D/D
		ridgeF1, ridgeM1 / ridgeM1, ridgeF1	S/S
		Total: 48	**24 S** **24 D**

5. Procedures

The participants were examined individually for around 20 minutes in a quiet room. The data were elicited in two phases: training and experimentation. The training phase was conducted first to orient the subjects and train them on using the computer to perform the discrimination task. Each participant was asked to wear a headset and sit in front of a laptop computer for the experimentation phase. Next, the participant initiated the experiment by clicking on the *click to start* button. In all, there were 96 trials. In each trial, the participant listened to two stimuli, and on a laptop screen, two choices appeared: same and different. The participant responded to the trials by clicking

on either the *same* or *different* buttons as they heard the stimuli. The stimuli were presented in four blocks of 24 trials each. The subjects could take a short break between blocks; thus, there were three short breaks for the whole experiment. This phase took about 15 minutes for each subject (Figures 1, 2,3).



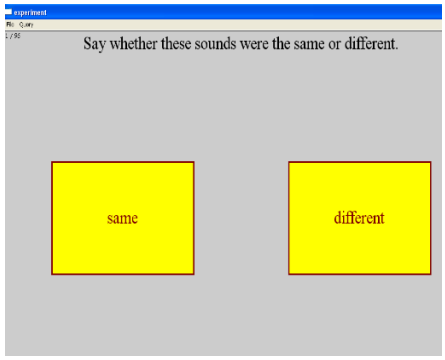


Figure 1: Pre-Start Step of the Experiment**. Figure 2**: The Start Step of the Experiment

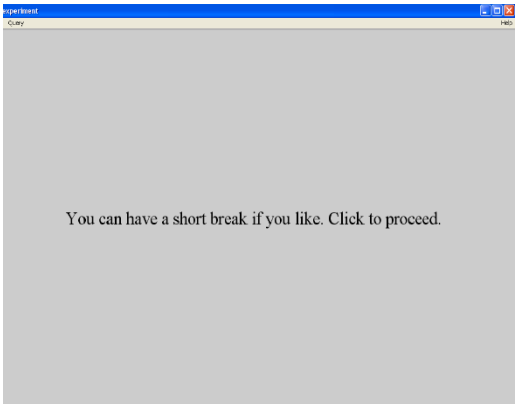


Figure 3: Inter-Experiment Interval

6. Data Analysis

All the experiment results were extracted from the PRAAT software and transferred to Excel for scoring purposes. A score of either '0' or '1' was awarded for each trial: 0 for a wrong answer and1for a correct answer. The data was then analysed using the SPSS programme (Statistical Package for Social Science) to measure the perceptual ability of native Yemenis to differentiate English phonemic contrasts and to measure the differences between both groups (LLOR and SLOR Malaysia). To detect the effect of LOR on their perceptibility, we applied an independent sample T-test.

7. Results

7.1 The effects of context (word-initial and word-final position) on the perceptual ability of phonemic contrasts in English:

The result shows clear differences in the mean scores of all participants' perceptions in different contexts. The perception of word-initial position (M= 66.46%, SD= 10.20) was higher than the perception of word-final position (M= 59.42%, SD= 11.98), as presented in Table 4.

Table 4: Perception of the Voicing Contrasts by All Participants in Different Contexts

Context	N	Mean	Minimum	Maximum	95% Confidence Interval for Mean		Std. Deviation
					Lower Bound	Upper Bound	
Word Initial	42	66.46	45.83	85.42	63.28	69.64	10.204
Word Final	42	59.42	33.33	83.33	55.69	63.15	11.983

7.2 *The effect of length of residence in Malaysia on the perception of the selected phonemic contrasts in English by Yemenis learners of English as they are presented in different contexts (e.g., word-initial and word-final position)*

The results showed a significant difference in P-value < 0.05 in the perceptual ability of the phonemic contrasts between the two groups of participants. In addition, both groups differed significantly with regard to word-initial and word-final positions (Tables 5 and 6). The independent sample T-test showed a significant effect for context on the perceptual ability of phonemic contrasts in English. The summary of the independent sample T-test is presented in Table 6.

Table 5: Descriptive Statistics of Participants' Performance in Different Contexts

Contexts	Groups	N	Mean	Std. Deviation	Std. Error Mean
Word-initial	Group A	21	61.01	9.060	1.977
	Group B	21	71.92	8.2972	1.810
Word-final	Group A	21	53.37	10.384	2.266
	Group B	21	65.47	10.470	2.284

Table 6: Independent Sample T-Test

Contexts	Mean differences	Std.Erro differences	Confidence Interval of the difference 95%		t	df	Sig. (2 tailed)
			Lower	Upper			
Word-initial	-10.91	2.680	-16.33	-5.49	-4.07	40	0.001
Word-final	-13.00	3.218	-18.60	-5.59	-3.76	40	0.001

In summary, All participants in the two groups had significantly different perceptual abilities (LLOR and SLOR) in different contexts of phonemic contrasts (word-initial and word-final position). The participants in both groups performed better in the word-initial position than in the word-final position. The results are presented graphically in Figure 4.

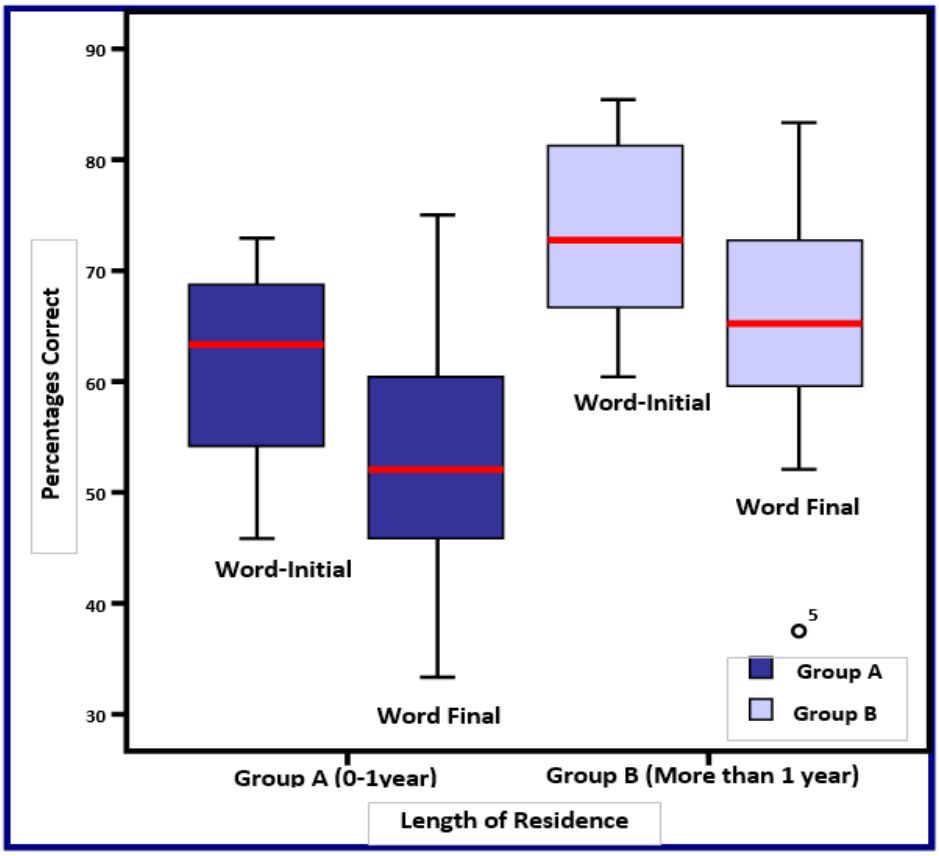


Figure 4: The Perception of Phonemic Contrasts in Word-Initial and Word Final Position by All Participants and Between Groups

8. Discussion

The goal of this study was to investigate the influence of different contexts of phonemic contrasts on the perception of the Yemeni EFL learners and to find out whether the LOR in Malaysia has an effect on the perception of the selected phonemic contrasts in English by Yemeni EFL learners as they are presented in different contexts. The results revealed a statistically significant difference in the scores of the two groups of

participants on the discrimination test. Scores for the LLOR were higher than scores for the SLOR group. These results suggest that when an individual's LOR increases, their perceptual performance for voicing contrasts increases as well. In other words, increases in the LOR in Malaysia are directly proportional to increases in the participants' mean scores in the discrimination task. This could be because the higher the LOR, the more the exposure to a large amount of L2 input [31].

Clearly, native Yemeni EFL learners can improve their perceptual ability for the L2 sounds absent in their L1 and develop new phonetic categories over time. This finding supports the findings of previous studies [15-19, 32, 33]. Such results can be attributed to the level of integration achieved by Yemeni EFL learners in Malaysia, as was suggested by [32, 34].

Moreover, the results demonstrated that native Yemeni EFL learners faced more difficulties in the perception of English phonemic contrasts that are absent in their L1 in the word-final position compared to that in the word-initial position. This indicates that the context does have an effect on the perceptual level of the phonemic contrasts in English by native Yemeni EFL learners, as the performance of native Yemeni significantly differs when the phonemic contrasts are presented in different contexts. These results are in agreement with previous studies [35, 36]. Ding et al. [35] found that most mandarin students face challenges in perceiving and producing voicing contrasts of word-final stops in English; whereas, Maiunguwa [37] found that, in Hausa EFL learners, the production and perception of /v/, /θ/, and /ð/ in word-initial position were easier than it was in word-final position.

9. Implications for EFL Pedagogy:

From the results of this study, Yemenis EFL learners will know that it is not impossible for the learners to acquire L2 new sounds. They will pay more attention to the mismatch between the two languages and try to seize any opportunity for greater exposure to the L2. The results explained that learners who lived in Malaysia for a long time performed better than those who lived in Malaysia for a shorter time. That means, as Yemenis learners were exposed to and practiced the second language; their phonemic categories developed and improved. in view of the results of the study,, the learners should help themselves by finding opportunities for exposure to the L2, and to use the L2 more often than their L1 even when communicating with fellow L1 speakers. That is because the residence in an L2 country without seizing each opportunity to practice and expose to L2 will not cause any kind of improvement. A list of implications for EFL Pedagogy is stated below:

- L2 teachers should focus on teaching pronunciation and examine the perception of their students to be able to Perceive and communicate effectively in the L2. Teachers can highlight to their students the phonological differences between Arabic and the target language.

- Providing students with virtual interaction with native or native-like speakers of English can provide them exposure to the English language and increase the length of practicing the English language; so, by replacing the absence of the native speaker of English [38].
- Designing remedial activities and exercises concentrating on English pronunciation, listening, exercises of confusing words, and practicing voicing distinctions in the curriculum for the students to practice [8].
- Apply different methods when teaching English as a Foreign language. Furthermore, listening to native speakers on TV and the radio while watching English programs improves listening skills and improves appropriate pronunciation and phonemic perception.

10. Limitations:

The limitations of this study are explained below:

- The results of this study will not be generalizable to all Yemenis ESL learners because the participants of this study were restricted to the participants who speak Arabic dialects in south Yemen only. In addition, the results of this study are also not generalizable because of the small sample size; only 42 participants took part in this study.
- The aural stimuli were prepared by using two models of native UK speakers available from the AT&T text-to-speech computer program. Then, the validity of the aural stimuli was tested with a near-native speaker; a Malaysian speaker who can perceive the relevant contrasts in the study. Nevertheless, this study lacks a control group (i.e. native speakers of the UK) to examine the validity of the aural stimuli.
- Studies that have examined the perceptibility of L2 sounds have claimed that age of learning a second language (AOL) and age of arrival (AOA) has a strong effect on the performance and the improvement of the perception ability of cross-language differences [16, 17]. However, this study looked only at the effect of length of residence on the perception of cross-language differences. The effect of AOA and AOL was not tested in this study. So, the difficulties that faced the Yemeni EFL learners in the perception of English phonemic contrasts may not be complete due to the differences in LOR in the two groups. The results would be more convincingly interpreted if the participants' AOA and AOL were also taken into consideration and matched in both groups that varied in LOR.

11. Conclusion and Recommendation

The main aim of this study was to examine the influence of different contexts (word-initial and word-final phonemic contrasts) on the perception of the phonemic contrasts

among Yemeni EFL learners and to investigate the effect of LOR of Yemeni EFL learners in Malaysia on the perception of English phonemic contrasts that are absent in Yemeni dialects of interest in this study, i.e., (/p/, /b/), (/f/, /v/), and (/ʧ/, /ʤ/). The findings revealed a significant effect on the improvement of the perception of the phonemic contrasts for LOR in the L2 country: the LLOR participants living in Malaysia performed better than their SLOR counterparts. Moreover, the participants in both groups perceived English phonemic contrasts in word-initial position better than in word-final position.

This study could serve as a step in investigating the cross-language differences between Arabic and English and their effects on the perception–production ability. Additional research is needed to determine the influence of age of arrival and age of L2 acquisition on the development of Yemeni EFL learners' perceptual abilities in distinguishing English phonemic contrasts. Research is also required to look at how native Yemeni speakers perceive and produce English phonemic contrasts in connection to other parameters including language learning age and arrival age. Besides, the present study investigated the perception of English consonants that were absent in the selected Yemeni dialects. So, it will be interesting if further research examined the perception of both English consonants and vowels that do not occur in selected Yemeni dialects and other Yemeni dialects. Further research to be conducted with large sample size is also needed for generalizability.

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